Appendix D

Preliminary Water Market Analysis, PN-HFS-008

Technical Memorandum

Henrys Fork Basin Study
Preliminary Water Market Analysis

Technical Series PN-HFS-008

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For

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1 Background and Purpose

The Bureau of Reclamation (Reclamation) is conducting the Henrys Fork Basin Study to assess the potential opportunities to improve water supply conditions in the Upper Snake River Basin and Eastern Snake Plain Aquifer (ESPA). The Basin Study is considering a variety of alternatives including development of new water storage, expanded aquifer recharge, and improvements in water management. Water markets provide one potential mechanism to promote efficient water uses and minimize the economic impacts of periodic drought conditions. This memo report provides a case study analysis of water markets to inform the Basin Study of potential options for development of an expanded water market as an alternative or companion to other opportunities to improve regional water supply conditions. This analysis is intended to offer a "high-level" review, and therefore, does not provide an assessment of the feasibility associated with an expanded water market in the region or recommend a potential market structure.

In many parts of the western United States, including Idaho's Snake River Basin, water markets have developed as a means to temporarily or permanently reallocate available water supplies to uses with higher economic values. Prices and market activity established in water markets can provide important signals to market participants and public agencies regarding the costs and benefits of developing structural water supply alternatives such as new surface storage and aquifer recharge projects. They also can be compared to the costs associated with water demand reduction alternatives such as implementation of improvements in on-farm irrigation efficiency or promotion of a less water-intensive cropping pattern. In general, water markets represent one of a broad set of tools to address water resource constraints in a particular region.

This analysis explores the regulatory and economic factors that are necessary for water markets to effectively operate and briefly compares those factors to conditions in the Henrys Fork Basin. Examples of currently active water markets are used to illustrate some key market considerations. The analysis of operating market regions includes:

1. Regulatory Environment – Markets for water can be regulated in a variety of ways to satisfy water supply objectives. This can include regulatory constraints on certain types of market transfers or the development of market demand through regulatory drivers that create incentives for trades. The existing regulatory environment for market-based mechanisms in the selected regions will be compared in order to provide information on the variety of forms available for market development.
2. Water Supply and Demand – Water supply availability and alternative water uses within the region have important implications for market-based opportunities to support reallocation of existing water supplies and to provide economic incentives for water supply development projects. Market-based approaches are generally the most effective in areas where the marginal value of water in alternative uses exceeds the value in existing uses or the costs associated with freeing up or developing a new unit of water supply. Where opportunities for "gains from trade" are limited, competitive water markets will not emerge.
3. Market Participation – The level and type of market participation within the selected regions will be compared and contrasted. In particular, the market activity by water use type will be identified. In many regions, water supplied to the market is associated with surplus water supplies or obtained through fallowing irrigated land planted to pasture and hay crops. This section will consider the mechanisms through which water is supplied to the market in the selected regions.
4. Water Pricing and Trading – The level of water prices and associated trading will be compared among the selected regions to evaluate the price levels that can be supported by end user categories and to provide a comparison to the value and costs of alternative water supply opportunities.

2 Existing Idaho Water Market Conditions

Water use in the region is dominated by the irrigation of forage and annual crops. The region is sparsely populated and there is relatively little competing demand for water from urban, commercial, and industrial users aside from some growth in the dairy industry and localized urban areas. Some of the largest downstream water

demands (below Milner) consist of annual leases by Reclamation for flow augmentation and annual (and multi-year) leases by Idaho Power. As a result of the limited urban and industrial growth in the region or the presence of high value permanent crops, there have been few permanent water right transactions (water rights sold separately from land) in recent years. However, there is an active lease market for water through the Water Supply Bank and Rental Pools that historically has been used to reallocate water predominately for agricultural uses. These programs are briefly described below.

2.1 Water Supply Bank and Rental Pools

The State of Idaho manages one of the oldest water market systems in the country. The state issued its first lease in 1932, and in 1937 the first formal bank was launched – the Upper Valley rental pool. For decades, water banking continued without specific legislative authority. In 1979, the Idaho Legislature formalized water banking "for the purpose of acquiring water rights…from willing sellers for reallocation by sale or lease to other new or existing needs". The water banking statute authorized Idaho Water Resource Board (IWRB) to administer and operate water banking throughout the state. Two distinct types of water markets currently operate in the ESPA region:

1. The State Water Supply Bank which leases surface and ground water throughout the state.
2. The five regional rental pools that focus on storage water leases/rentals within their respective districts. The Lemhi rental pool provides for leases/rentals of natural flow.
3. The Shoshone-Bannock Tribe also operates a water supply bank that has, to date, been used to support rental of water below Milner by Idaho Power.

2.1.1 Water Supply Bank

The Idaho Water Supply Bank (WSB) provides a centralized mechanism to lease (deposit water to the bank) and rent (withdraw water from the bank) surface and ground water rights throughout the state. The WSB was created to promote trading and leasing of inactive water rights and to provide a source of funding for water infrastructure across the state. The WSB facilitates transactions across the entire state in contrast to the regional rental pools (RRP) which primarily serve their specific water districts. The WSB processes both ground and surface water rentals while the RRPs exclusively rent reservoir storage water (with the exception of surface water rentals in the Lemhi rental pool). In 2007, the Wood River Basin Enhancement Water Supply Bank was established to facilitate donated water rights dedicated to meet established minimum flow objectives in the Big Wood and Little Wood rivers. The bank was not designed to facilitate leasing and trading but was intended to encourage donations. Since its inception, a limited number of water rights have been donated to the program. However, the IWRB continues to modify the operating procedures to encourage more participation.

Any water right holder can lease and rent surface or ground water. The WSB rules define the bank's administration including setting the suggested prices for deposits and rentals. Technically, prices can be negotiated by private parties. However, the WSB currently has a suggested rental rate of $14/acre-feet (af)/yr (increasing to $17/af next year). The suggested rental rate provides an important price signal to participants since lessors must generally set their desired rental rates at or near the WSB suggested rate to increase the likelihood of a rental. Each water right is subject to a $250 lease fee with a combined maximum of $500 for water rights with a common place of use, diversion rate, or diversion volume. IWRB also collects an administrative fee of $1.40/af regardless of the negotiated rental price.

Several criteria must be met for IDWR to process a rental agreement. IDWR must determine (among other criteria): (1) a hydrological connection between the water right leased and the proposed rental location, (2) no injury to other water users from the rental, (3) that the water will be put to beneficial use and (4) that the rental is not used for a use that requires a permanent water right (unless the renter can demonstrate a reasonable effort is being made to provide for the long-term water use) and (5) it does not result in an enlargement of the water right. IDWR can authorize temporary changes in point of diversion, place of use, or nature of use for a given rental. Leases and rentals longer than five years require a public notice and IWRB approval. On average, 11 percent of the water rights deposited are rented from the WSB indicating limited demand for annual water

even at the relatively low established price during normal and wet years. The WSB rents approximately 17,000 af/yr, on average with higher activity in dry years.

2.1.2 Regional Rental Pools

As previously described, IWRB also administers five regional rental pools (RRP), which are operated by local water districts. The five rental pools include:

- Snake River (WD01)
- Boise River (WD63)
- Payette River (WD65)
- Payette Basin on Lake Fork (WD65K)
- Lemhi River (WD74)

The regional rentals pools exclusively rent storage water rights, with the exception of WD74, which only rents natural flow surface water rights. A primary purpose of the RRPs is to provide irrigation water to reservoir spaceholders within a district and to maintain a rental pool with sufficient incentives such that spaceholders supply, on a voluntary basis, an adequate quantity of storage for rental or lease and ensure that participants have priority over non-spaceholders. The rental pools were initially established to provide a source of water for irrigation and have been expanded to other uses such as flow augmentation and hydropower production. IDWR appoints a local committee to administer each rental pool. The committee establishes the rules, the pricing and the operating procedures that govern each. The procedures define the priority for rentals, the order of assignments and the rental prices - which may vary depending on place and type of use and water supply. In general, rental rates range from $6 to $20/af/yr. The rental pool rules are designed to favor in-basin agricultural water use. Most rental pools have adopted a “last to fill” rule that encourages water rentals within the basin. Under the “last to fill” rule, reservoir water rented for non-irrigation uses outside of the district are the last to be re-filled in subsequent years. Consequently, if there is a shortage, these contracts will be the first to be shorted water. In addition, most rentals pools charge a higher rate to rent water outside of the district. This provision has resulted in higher prices for water that is rented for use below Milner.

The rental pools serve an important function by streamlining the review process for temporary transfers. In 2005, the Snake River Rental Pool (WD01) significantly modified its operating procedures in order to better address the demands for basin water. Most notably the rental pool now supports private leasing and provides dedicated storage space for environmental flow rentals. Private leases were initiated to provide a source of water to mitigate the impact of groundwater pumping on senior surface water right holders and are now also being used to provide a surface water source for agricultural needs in WD01. The price and lease terms of these transactions are negotiated privately.

Backed by large reservoirs, the RPPs process large volumes of leases each year. The WD01 and WD63 are the most active regional pools with annual average leases exceeding 150,000 af. The rental pools primarily lease water out of basin. In the WD63, WD65 and WD01 rental pools over 80 percent of the leases go out of basin despite the last to fill rule. The majority of this water was uncontracted and surplus within the pool, and therefore, not subject to the last to fill provisions. These out of basin transfers are primarily driven by demand from Reclamation, and to a lesser extent, from Idaho Power. Reclamation consistently rents water out of a basin to meet instream flow objectives for salmon recovery while Idaho Power rents water in support of hydropower production. In the WD01 rental pool, the price for the private party leases is consistently lower than the bank’s fixed prices. However, the rental pool rate fluctuates each year based on storage in the reservoirs. As a result, in 2010 following a dry year in the region, the bank rental price reached its highest recorded level - $20.60/af/yr.

In recent years, irrigation entities have utilized the rental pool to provide water for aquifer recharge purposes. The recharge activity was funded by the Idaho Water Resources Board for approximately $3/af and has consisted primarily of stored water that is at risk of spill due to wet conditions. This highlights the potential future opportunity to generate “credits” for temporarily storing lower valued wet year water in the aquifer to provide mitigation for water use during subsequent dry years.

3 Comparative Water Markets Analysis

This section describes some important elements of operating water markets through presentation of "case study" markets. The case studies have been selected to illustrate key similarities and differences among market regions to inform the Basin Study of potential issues and opportunities associated with expanded water markets in the region. This analysis is intended to offer a "high-level" review, and therefore, does not provide an assessment of the feasibility associated with an expanded water market in the region. In addition, the review is also not intended to provide recommendations for a suitable regulatory framework or market structure. The water market examples are primarily selected to characterize the diversity of potential water market structures available to the region. In general, this section organizes the market examples according to the following themes:

Single-Purpose Programs: Much of the focus of water markets in the ESPA has been on "demand reduction" which consists of an effort to buy-down existing irrigation water rights in an effort to create a lasting balance between water demand and available supply and to satisfy senior water rights. These types of single-purpose purchase programs are a form of water market that has developed in the western U.S. to avoid or resolve legal disputes and economic disruption or reallocate water supplies for environmental and urban purposes.

Competitive Markets: Competitive markets are distinct from single-purpose water acquisition programs because there tend to be many buyers operating independently to acquire water rights. Water right prices are established by negotiation and, therefore, respond to changes in both water supply and demand. Competitive markets provide a means of reallocating available water rights in regions with changing demand for water often associated with increasing urbanization and permanent crop plantings.

Mitigation/Credit Markets: There has also been some interest in creating a "credit" market that can be used to support mitigation for out-of-priority water uses in the ESPA. In general, mitigation demand is a component of several operating water markets in the western US. Mitigation markets can take on a variety of forms in support of individual water users and projects. As a result, mitigation demand has become present in the larger context of the market and competes alongside other demands for water. There have been some efforts to create market programs that are entirely based on satisfying mitigation objectives. However, there are few successful examples of market programs that are entirely based on mitigation due to the challenges associated with credit accounting and integration with the existing water rights legal system.

Exhibit 1 provides a summary of the market types and the case studies that will be presented in the following sections.

EXHIBIT 1
Selected Case Studies

Market Type	Case Study
Single-Purpose Programs	Newlands Project, NV
	Palo Verde ID, CA
Competitive Markets	Yakima Basin, WA
	South Platte, CO
Mitigation/Credit Markets	Deschutes Basin, OR
	Active Management Areas, AZ

3.1 Single-Purpose Programs

3.1.1 Newlands Project, NV

Region Description: The Newlands Project is located in the lower Truckee and Carson basins in Nevada. It is one of the first Reclamation irrigation projects developed and currently supports irrigation of approximately

65,000 acres. Irrigated crops primarily consist of pasture and hay with some small grains grown in rotation with alfalfa.

Water Market: Section 206 of Public Law 101-618 (The 1990 Fallon Paiute-Shoshone Indian Tribal Settlement Act/Truckee-Carson-Pyramid Lake Water Rights Settlement Act) directed the United States Secretary of the Interior, through the Fish and Wildlife Service (FWS), to purchase water rights in the Carson Division of the Newlands Project, with or without land, and to transfer the water to sustain and expand the Stillwater National Wildlife Refuge. The goal of the Water Right Acquisition Program is to sustain a long term average of 25,000 acres of wetlands in the Lahontan Valley.

The Water Rights Acquisition Program has been in existence since the early 1990s. The program operates on a "willing-seller" basis and establishes an offer price for water rights based upon a programmatic appraisal that is updated annually. When land is acquired with water rights, the FWS attempts to resell the land after the water rights are transferred for environmental purposes. Currently, the program is offering between $3,500 and $5,000 per acre (approximately $1,000 to $1,250 per af) to permanently acquire surface water rights. The program is targeting 75,000 af and to date has acquired approximately 42,000 af through acquisition of approximately 14,000 acres of irrigation water rights.

Key Considerations: The Water Rights Acquisitions Program has resulted in significant changes to the Truckee-Carson Irrigation District (TCID), the entity that manages water supply in the Newlands Project. Currently, FWS is the largest single customer of TCID and pays annual assessment fees to support district operations similar to agricultural users. Transfers of water rights to the refuge are limited to consumptive use as opposed to annual duty. The continued assessment payments and limitation on the volume of water transferred help to ensure that the remaining agricultural users within the project are not negatively affected by the acquisition program. One area of ongoing concern centers on the stewardship of land that is acquired by FWS. Currently, there is no regulation requiring the program to manage the land for weed control and dust abatement.

3.1.2 Palo Verde Irrigation District, CA

Region Description: The Palo Verde Irrigation District (PVID) is located in parts of Imperial and Riverside counties, California. The district includes approximately 130,000 acres that are irrigated primarily from senior water rights to the Colorado River. Nearly 60 percent of the irrigated land is planted to alfalfa in most years with the remaining acres planted to cotton and rotation crops. The long growing season and ample water supply provides for more than seven cuttings of alfalfa for many producers supporting high land and water values.

Water Market: Under a 35-year fallowing agreement that began in 2004, PVID irrigators may choose to fallow their land on an annual basis, and transfer conserved water for municipal use within Metropolitan Water District's (MWD) service area. The amount of water transferred each year depends on landowner participation, and the quantity of water MWD calls for. Participating landowners received a one-time payment of $3,170 per acre for joining the fallowing program, and subsequent annual compensation of $602/year for each fallowed acre. This annual fee is equivalent to $143.33/af/yr assuming 4.2 af of consumptive use (CU) credit per acre fallowed. Annual payments increase at a rate of 2.5 percent per year. The fallowing program currently limits total fallowed acreage to 29 percent of the district's service area. Under the program, the minimum level of annual fallowing is 7 percent of the district's service area. In addition to the payments made to participating landowners, the agreement requires MWD to provide funding for the regional community to offset the negative economic effects of the long-term transfer. On average, the rotational fallowing agreement has provided more than 87,000 af/year to MWD since its inception.

In addition to trades under its long-term agreement with MWD, PVID has negotiated other water leases. In 2009, PVID agreed to sell additional water to MWD under a one-time, single-year sale at a price of $340/af/yr. More than 24,000 af were sold in this single-year transfer. The premium price in this agreement was attributable to the severe drought conditions during 2009 that significantly increased MWD's willingness to pay for short-term emergency supplies.

Key Considerations: The development and implementation of the PVID contract with MWD serves as an example of the lengthy administrative and negotiation processes that can accompany these land-fallowing, water-leasing programs. The prolonged negotiations associated with the 1992 test program resulted from farmers' concerns that leaving 20 percent of their land fallow would result in environmental degradations, job loss, and weakening of the farming culture in the valley. The proposed duration of the program (35 years) also represented a source of concern for many farmers. In contrast to the land and water acquisition program operated by the FWS in the Newlands Project, the lease rotational program offers increased flexibility to participating agricultural producers. The buyer (MWD) is able to fulfill its varying annual needs without excess or shortage. Additionally, because water rights are leased annually and not transferred permanently, lease rotational programs allow for continued farming and ranching activities, minimizing land stewardship concerns and permanent reduction in the agricultural economy.

3.2 Competitive Markets

3.2.1 Yakima Basin, WA

Region Description: The Yakima River Basin, located in Benton, Kittitas, and Yakima counties, covers nearly 6,000 square miles. The Yakima River and tributaries originate in the Cascade Mountain Range, flowing south and east to its confluence with the Columbia River. The warm, relatively dry climate and rich volcanic soil of the area, combined with an extensive irrigation network capable of supplying water to more than 450,000 acres, have resulted in an important agricultural industry in the Basin. The farm sector is well-diversified, producing a wide variety of tree fruits (apples, apricots, cherries, pears, and peaches), vegetables (sweet corn, potatoes, and asparagus), grapes (wine and other), and field crops (hay and wheat), and a significant dairy and beef industry.

Water Market: There is a relatively active lease and permanent acquisition market for water rights in the Yakima Basin. Climate conditions and limited surface water storage in the Yakima Basin result in periodic droughts that require regulation of water rights according to priority date. In general, water rights that are issued after 1905 are subject to regulation during drought years and may be curtailed for all or part of the irrigation season in support of senior water rights. As a result, sales and leases of water rights in the Yakima Basin have primarily involved senior water rights that are not subject to regulation in drought years.

The high proportion of permanent crop plantings in the lower basin combined with the variability of surface water supplies has prompted agricultural users to participate in both lease and sale markets for water rights in order to maintain adequate irrigation for high-valued orchard and wine grape production. The majority of the water supplied to the market comes from irrigated pasture and hay ground located in the upper portion of the basin. Annual water leasing activity is generally limited to drought years when junior water rights used to irrigate permanent crops fall out of priority. Permanent water right purchases are also relatively common and tend to be associated with environmental and urban uses as well as the development of previously dry ground for wine grape production.

Water right prices in the Yakima Basin are established through negotiation by participating parties. Water right transaction activity and pricing in the lease market tends to vary in proportion with the severity of drought. That is, prices and volume traded increase with increasing levels of drought. Annual lease prices have ranged from approximately $30/af/yr to $500/af/yr. The average price for recorded leases is $100/af/yr. During the last decade, more than 30,000 af have been traded in the lease market through temporary fallowing of pasture and hay ground. The market price of water rights traded permanently in the Yakima Basin has ranged from approximately $1,500/af to $8,000/af in recent years with an average price of approximately $2,000/af.

Key Considerations: The water right market in the Yakima Basin emerged due, in part, to disparities in water values. Agricultural producers in the lower basin growing a variety of permanent crops could afford to compensate agricultural producers in the upper basin who predominately irrigate hay and pasture. In addition to the water value differences, development of an expedited regulatory review process was important. Water right transactions in Washington, like many other states, often require an extensive and lengthy regulatory review period. During drought periods, the delay caused by the regulatory process hindered the effectiveness of the water market in limiting the damages to permanent crops from inadequate irrigation. In order to facilitate

trading, the Yakima Water Transfer Working Group (YWTWG) was established. YWTWG is a voluntary team of agencies and water users that meet to provide technical review of proposed water right transfers in the basin. The YWTWG process guides applicants to those types of water right changes and transfers that can quickly and easily gain approval from the state. This inter-agency cooperation has helped to limit the transaction costs and provide a more effective and efficient platform from which to complete water right trades.

3.2.2 South Platte, CO

Region Description: The South Platte Basin encompasses over 27,600 square miles of northeastern Colorado. The South Platte River runs from its mountain origins southwest of Denver to northern Colorado's high plains region. Stream flows in the South Platte and its tributaries are primarily determined by snowmelt runoff and rainstorms, rendering the basin's surface water supply highly variable. Irrigated agriculture comprised over 30 percent of the basin's land area and 68 percent of the basin's water dedicated to crop cultivation, primarily hay and grains. In addition to its extensive agricultural areas, the South Platte Basin is home to Colorado's largest urban center, Denver, as well as rapidly growing communities near Boulder and Ft. Collins along the northern Front Range. As Denver and other areas have urbanized competition for water has intensified driving sales from agricultural to municipal uses.

Water Market: Urban populations and associated water demand throughout the South Platte Basin continues to increase. One common method for cities to expand water supplies is to purchase ditch company shares from farmers, and transfer the shares to municipal use. While cities purchase more shares than other water buyers in the basin, non-municipal buyers remain active in the water market.

Most water purchases by non-municipal users occur to fulfill "augmentation" requirements. If a farmer withdraws groundwater for irrigation, and surface water supplies are depleted as a result of this groundwater pumping, the farmer must add surface water to the affected stream to prevent injury to more senior water appropriations.

Surface water supplies in the South Platte Basin are fully allocated. As a result, new water users must acquire existing water rights/shares in order to obtain access to a reliable supply. The majority of the water in the basin is utilized for agricultural purposes and many new water uses are being supported through the purchase and conversion of irrigation water rights. There is currently a limited lease market in the South Platte Basin and the majority of water rights are traded permanently. Over the last decade, the annual volume of permanent water right trades has ranged from 2,000 af to 5,000 af annually although the recent downturn in the economy has slowed the pace of acquisitions. Prices vary primarily according to the location and reliability of the water rights. In general, surface water rights located further downstream from Denver sell for a lower unit price due to the lower urban demand and the challenges associated with conveying the water upstream. In addition, water rights with senior priority dates or that are supported by surface storage generally sell for higher prices as they provide increased water supply reliability to the buyer. Due to the variability in water rights, prices have ranged widely from approximately $500/af to more than $40,000/af. The average price among all recorded trades is approximately $8,000/af.

Key Considerations: The regulatory process for changing water rights from one use to another in Colorado requires extensive legal and technical analysis and review. Water right changes are administered by the Colorado Water Court. The Water Right Determination and Administration Act of 1969 created seven water divisions based upon the drainage patterns of various rivers in Colorado. Each water division is staffed with a division engineer, appointed by the state engineer; a water judge, appointed by the Supreme Court; a water referee, appointed by the water judge; and a water clerk, assigned by the district court. Water judges are district judges appointed by the Supreme Court and have jurisdiction in the determination of water rights, the use and administration of water, and all other water matters within the jurisdiction of the water divisions. The highly judicial process for changing water rights results in high transaction costs and tends to limit participation in the market to high-valued water uses that can afford the time and expense required to transfer water.

3.3 Mitigation/Credit Markets

3.3.1 Deschutes Basin, OR

Region Description: The Upper Deschutes Basin in Oregon was heavily developed beginning in the late 1800s to support agricultural production in the region. A number of irrigation districts were formed as extensive water storage and canals were constructed to support the use of surface water from the Deschutes River and its tributaries. Much of the irrigated land is planted to pasture, hay, and annual crops. Rapid urbanization beginning in the 1990s and increasing environmental concerns over low stream flows in the Deschutes River and other tributaries creating conflict among the different water users.

Water Market: The Oregon Water Resources Department (OWRD) instituted water mitigation requirements for new groundwater pumping in 2002 to offset the effects of groundwater pumping on surface water flows. These requirements mandated that applicants for new groundwater permits satisfy mitigation obligations prior to receiving a new permit. The Deschutes Water Alliance Bank (DWAB) was developed to provide a mechanism to create and supply mitigation credits to the market. The bank supplies both temporary (lease) and permanent mitigation credits needed for all new groundwater permits in the Deschutes Basin.

The DWAB is the sole supplier acquiring and brokering mitigation credits through the bank. Mitigation credits can be generated via several methods including instream transfers of water rights, aquifer recharge, storage releases and water conservation projects. However, only transfers of water rights have been used to create credits to date. Permanent mitigation credits are generated when irrigation water rights are deeded to the state and retired. The state then issues mitigation credits based upon the amount of land retired from irrigation. There are six hydrologic zones which require geographically distinct water rights to generate mitigation.

The DWAB regulates the supply and pricing of mitigation credits in two ways. First, it crafted agreements with the irrigation districts to supply water rights to the bank. The bank then sells the credits at the cost of acquiring and processing the credits. The irrigation districts generally only make permanent water rights available to the bank as farmlands are urbanized. Second, credits are only created as they can be consumed. This is intended to prevent a speculative credit market from forming which may increase the price.

DWAB has been active since its inception in 2003 with activity peaking around 2007. Since 2008, permanent transactions have steadily declined while the volume of temporary lease mitigation remains high. The bank transacts more lease credits than permanent credits. To date, the lease credits have been primarily used to increase stream flows. Lease credits are priced at approximately $105/credit compared to permanent credits which range from $1,500 - $2,600/credit. To date, the DWAB sells 80 percent of the permanent mitigation credits to municipalities and private entities. The remaining 20 percent of the permanent transfers have been sold for environmental purposes (increased instream flow in the Deschutes River).

Key Considerations: The DWAB was formed to provide an orderly approach to reallocating water supplies from agriculture to new uses. Coordination among the participating entities helps to ensure that environmental and urban water uses are satisfied and that the remaining agricultural users are financially protected during the transition. The coordination and control of the market activity keeps water right prices within an acceptable range for agricultural producers that may desire to expand irrigated acreage or re-water ground that water rights were previously stripped from. The establishment of a “credit” system provides a “common currency” that can be easily traded within the established geographic zones and provides significant efficiency gains over the traditional water right change process.

3.3.2 Active Management Areas, AZ

Region Description: Rapid economic development in Arizona resulted in the depletion of groundwater resources in some areas of the state. In response, the state adopted the Groundwater Management Act and developed Arizona’s Groundwater Code in 1980. The Groundwater Code created Active Management Areas (AMA’s) within the state in locations with notable groundwater declines, and established groundwater management goals within each AMA to achieve “safe-yield” by 2025.

Water Market: Through a variety of legislative acts, Arizona established rules to promote entities with surplus supplies of surface water to store that water underground through recharge at permitted facilities. The process of recharging water may result in accumulation of Long-Term Storage Credits (LTSCs) that accrue in individual accounts that can be recovered at a later time. When crediting water to a LTSC, Arizona Department of Water Resources (ADWR) subtracts an amount that is retained in the aquifer ("cut to the aquifer")—this is typically 5 percent of the total volume of surface water that is recharged. These requirements are consistent with the goal of having the storage program provide a benefit to the aquifers even after recovery of the stored water. LTSCs may be used to support the account holder's future water needs or conveyed to another entity that needs them to remain in compliance with established rules for withdrawing groundwater.

In recent years, a market for LTSCs has emerged involving a variety of participants including municipalities, land developers, private investment firms and the Central Arizona Groundwater Replenishment District (CAGRD). In general, the market provides a means for entities with inadequate access to renewable water supplies to augment allowed groundwater recovery. While the transactions have been limited to date, they are expected to increase as a result of increased competition for renewable water supplied by the Colorado River. LTSCs, which provide for a one-time use of groundwater equivalent to 1 af, have ranged in price from approximately $80/credit to $150/credit.

Key Considerations: By creating rules and incentives for entities to accrue "credits" for recharging renewable surface water sources, Arizona has promoted activities that will help to achieve a long-term balance between groundwater supply and demand. In addition, the LTSCs, which have an indefinite life and can be traded anywhere within the AMA in which they were created, support an efficient market whereby entities with excess supply can sell LTSCs to those entities with more limited water resources. In this manner, the water market facilitates economic development opportunities throughout the region that might otherwise be constrained by the existing allocation of water rights and access to the existing surface water conveyance system.

4 Common Water Market Themes

Water markets represent one potential tool for managing scarce water resources. They can provide a cost-effective way of incentivizing efficient water use, limiting the economic impacts of water supply shortages, and reallocating existing water supply to meet changing societal needs. As demonstrated by the selected case studies, water markets can take a number of forms to satisfy a variety of regionally-specific goals and objectives. While no two water markets are the same, there are some common general themes. This section highlights some of the important commonalities among functioning water markets and generally relates them to conditions in the Henrys Fork Basin and ESPA.

4.1 Regulatory Environment

Water markets generally emerge because there is clear and enforced regulation in place that limits development of new water supplies or affects the water supply reliability associated with existing water rights. The efficiency of water markets can be undermined by regulatory ambiguity and lack of enforcement of existing rules. Within many locations, new enforcement of the conjunctive management of ground and surface water rights is expanding water market activity to support mitigation for existing and new water users.

Relevance to Upper Henrys Fork/ESPA: For a number of years, water "calls" by senior water right holders in the ESPA threatened to result in the regulation of a large number of junior groundwater pumpers and cause significant economic impacts to the region. A set of agreements negotiated by the State of Idaho with senior water right holders has limited the threat of future water rights regulation in the region. There are several regulatory and legal drivers that are creating the potential for development of a mitigation market. However, some policy changes will be necessary to identify the types of mitigation activity that will create some form of credit, particularly in an environment where the threat of future calls has been diminished. The Deschutes Basin and Arizona LTSC markets provide examples of the type of regulatory framework that is necessary to create clear rules for credit creating and trading. The Umatilla Basin, Oregon is also in the planning stages for development of

a credit market associated with an aquifer recharge project intended to restore groundwater elevations in over-pumped regions.

4.2 Economic Conditions

In addition to clear and enforced water rights regulation, local economic conditions are a large factor in determining the form and functionality of water markets. Many of the markets reviewed had a diverse range of water values within the market region, creating opportunities for gains from trade. These differences in relative value are necessary for competitive market trading activity to occur. Without adequate variability in water values, water markets generally take the form of single-purpose acquisition programs.

Relevance to Upper Henrys Fork/ESPA: In general, water prices within the Henrys Fork Basin and ESPA have been low relative to other market regions as exhibited by the prices observed in the well-established lease markets. The low prices reflect the low opportunity cost associated with the inactive water rights that are generally supplied to the market, as well as the policies of the regional rental pools which are designed to maintain water availability for in-district agricultural users. Even if the existing pricing and trading policies were relaxed, market prices would be limited by the payment capacity of agricultural producers in the region, aside from some limited demand for urban and industrial water supplies. Consequently, there may be relatively limited gains from trade among current water users within the region and limited opportunity for private water supply development projects (e.g., aquifer recharge, in lieu water use, crop idling) to be financially feasible. Put another way, the costs of supplying water to the market may exceed the willingness to pay of many potential market participants. As a result, promotion of more competitive water markets to increase water use efficiency or improve aquifer conditions is not likely to be successful. To be effective, public funding is likely to be necessary to support development of a single-purpose water acquisition program to reduce demand and/or subsidize the costs of projects to increase aquifer recharge. The costs of operating a publicly-funded program could be compared to the costs of developing additional surface storage, for example, to assess relative cost-effectiveness.

4.3 Efficient Approval Process

The traditional water right change process tends to be time-consuming and expensive. Streamlining the approval process will promote water trading and allow markets to more effectively respond to changes in hydrologic conditions. In many locations, the change approval process remains time consuming and expensive which limits the efficiency of water markets.

Relevance to Upper Henrys Fork/ESPA: The existing regional rental pools have established an efficient and streamlined process for transacting and completing regulatory reviews. One of the principle advantages of the rental pools is that lease approvals are completed at a local level. Any expansion of water markets in the region should leverage the existing approval process established by the regional rental pools.

4.4 Units of Exchange

Trading water rights is often challenging due to their different legal characteristics and uncertainty regarding the volume of water that will be approved for transfer. As described above, some water markets have developed “credit” systems that effectively remove the uncertainty and significantly reduce transaction costs. Developing “trading zones” and clear rules for creating credits will promote market trading and can provide the certainty needed to support private investment in credit producing projects.

Relevance to Upper Henrys Fork/ESPA: Currently, Idaho is actively pursuing aquifer recharge activities in the ESPA during high flow periods in an effort to improve aquifer conditions. Development of a credit system could create the appropriate incentives for entities to develop additional recharge capacity or expand current recharge activity. Credits created through recharge could be integrated in a market with credits generated through other mechanisms such as demand reduction. While accounting for credits would be challenging due in part to the transmissive ESPA aquifer, establishment of rules guiding credit creation and trading could be informed by the existing hydrologic model and ongoing efforts to develop a credit accounting system. It should be mentioned however, that IDWR does not currently have legislative authority to approve mitigation credits in support of new water uses or transfers of existing water rights that have not yet been filed.

4.5 Pricing

Water markets can operate with or without central price setting. Price setting is often viewed as a way of maintaining equity among market participants and preventing prices from reaching levels that are financially unsupportable for traditional farming purposes. However, significant tradeoffs are associated with a fixed price structure. For example, prices that are not freely allowed to respond to changing market and climatic conditions may lead to an over or under-supply of water to the market.

Relevance to Upper Henrys Fork/ESPA: The water market operated by the RRPs has successfully reallocated inactive water rights in the region for many years. While prices are administratively set, they vary according to climatic conditions in an effort to appropriately incentivize irrigators to supply water during drier years. As previously described, WD01 RP established its highest price ever in 2010 at approximately $20/af/yr due to dry conditions. As reported in the case studies, this price is well below the prices established in other water markets, particularly during dry years.

Expanding water market opportunities in the region beyond those provided by existing programs is likely to require higher prices. However, there is a limit to the prices that existing agricultural user can afford to pay. As previously discussed, public funding may be necessary to create incentives for additional water supply generated through market-based mechanisms. For example, funding could be made available to subsidize the cost of aquifer recharge or demand reduction (e.g. crop idling). This would help lower the cost for entities supplying the water and allow it to be sold at price levels that are economical for existing uses within the region. Further, there is the potential to differentiate prices based on the buyer's end use. For example, credits could be priced higher for municipal and industrial uses, which generally have a higher payment capacity than agricultural uses. Additional analysis would be necessary to compare the costs of a publicly supported water market program to funding of alternative water supply projects (e.g. development of additional above-ground storage capacity).

5 Conclusions

The development of expanded water market programs in the region provide a potential opportunity to assist in managing available water supplies to satisfy the goals of the ESPA Comprehensive Aquifer Management Plan as well as water needs in the Henrys Fork Basin. Water markets have been used successfully for many years in the region to reallocate inactive or lower valued water rights for agricultural, environmental, and hydropower purposes. However, the price of the water is significantly below prices observed in other water market regions suggesting that there may be limited demand from individual users for additional water at higher prices.

In recent years, the State has been pursuing managed aquifer recharge opportunities to improve water supply conditions in the ESPA. Recharge activities have been conducted when flow conditions allow for diversions for recharge purposes, typically during short windows in the spring and fall. These recharge activities have largely been completed with excess storage water and have not required fallowing or temporary idling of irrigated farmland to make water available. The availability of excess water for recharge purposes is expected to be limited during years when flows are not sufficient to create excess storage water. Therefore, available water sources will not be able to fully satisfy the 600,000 af goal to correct the imbalance in the ESPA without some level of reallocation including source conversions and demand reduction (temporary or permanent land fallowing or conversion to a less water-intensive cropping pattern). There may be additional opportunities to maximize the use of surplus water during wet years through development of additional recharge capacity. However, it is likely that expanded use of water markets in the Henrys Fork and ESPA to support current and future water needs will, at some point, require a reduction in the level of irrigation for participating agricultural producers. This represents a departure from past conditions where leased water has generally been excess to the owner's current demand.

Due to the relatively low prices for water and limitations on agricultural payment capacity in the Henrys Fork and ESPA, development of low cost water supply projects that can be funded solely by payments from direct beneficiaries may be challenging. Similarly, expansion of competitive water markets is likely to experience similar obstacles. It may be possible to develop a credit accounting system that will facilitate water trading among private parties and improve aquifer conditions by requiring a "cut to the aquifer" for recharge and demand reduction

activity. However, such a program will only benefit aquifer conditions if there is a sufficient level of private trading activity. This will be difficult to accomplish in the absence of increased water prices and public funding.

Despite the pricing challenges, there may be some opportunity to promote wet year recharge activities that benefit the aquifer and provide mitigation credits for out-of-priority water uses during dry years. It is unclear if the differential in the costs to recharge water during wet years and the market price during dry years will be adequate to support private trading given the temporal nature of recharge activities and associated credits and the necessary coupling of recharge location and mitigation. The requirement of a "cut to the aquifer" for each transaction will result in a need for an even wider cost-value differential. Even if the cost-value differential is adequate to support competitive market activity, it is unclear if the current regulatory environment will require a large number of water users to seek mitigation. It should also be noted that there is currently no policy or structure in place to support this type of market.

In order to expand the use of water markets in the region to improve aquifer conditions and meet projected future demands, some level of public funding or a broader funding base will likely be required. In the Umatilla Basin, Oregon, for example, an aquifer recharge program is being developed to reverse groundwater elevation declines of approximately 500 feet in an effort to maintain viability of farming operations. The estimated costs of the program appear to be relatively modest based upon an ongoing pilot project. However, even the relatively modest costs may exceed the payment capacity of agricultural producers. As a result, it is anticipated that funding for the project will leverage federal grant, county, and tribal funds to limit the portion of the project costs that irrigators will be responsible to cover. It is anticipated that a similar combination of public and private funding will be needed in the Henrys Fork/ESPA in order to develop a water market program that can provide significant contributions to restoring aquifer balance and meeting future regional water needs.